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(54) Windscreen wiper blade

(57) A windshield wiper blade assembly comprising a main yoke (2) and a secondary yoke (3) is characterised in that the latter is coupled to the main yoke by coupling means (16, 20) which allow relative rotation therebetween and relative displacement when the yokes are in a predetermined arrangement.

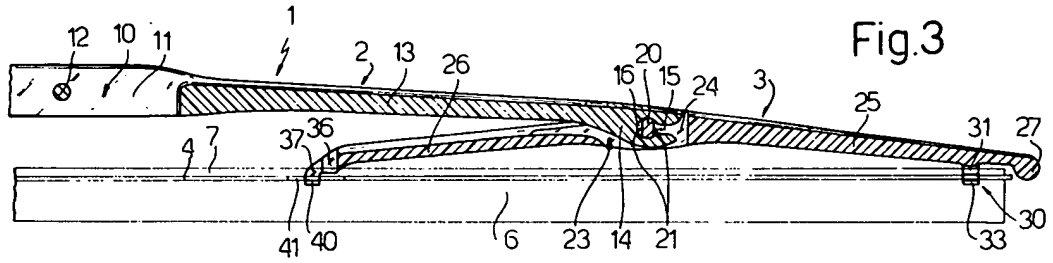

Fig.3

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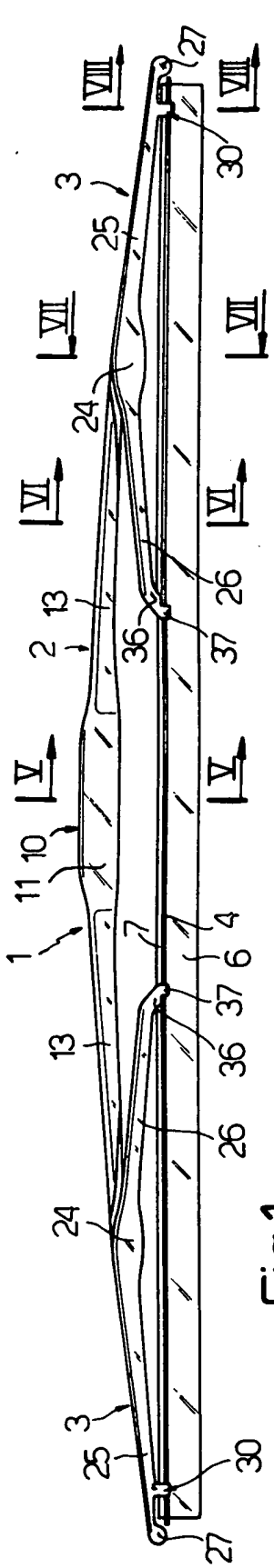

Fig.1

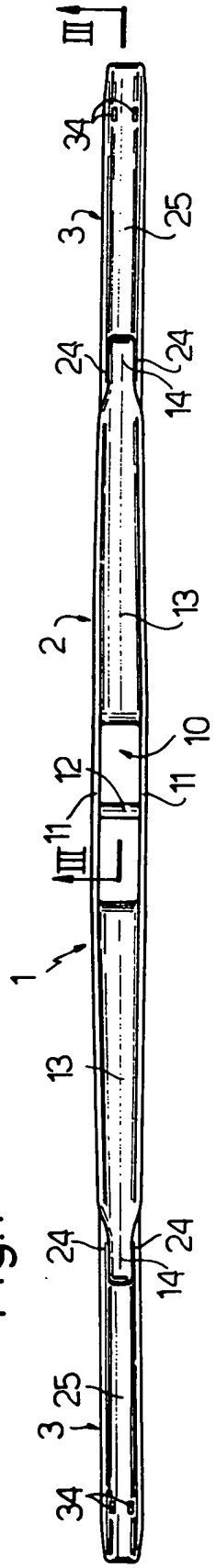

Fig.2

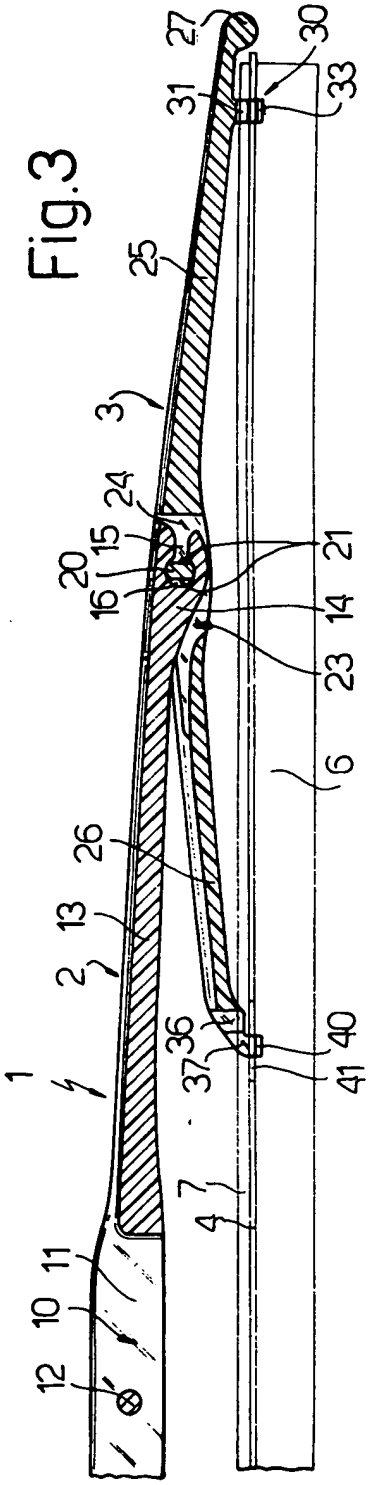

Fig.3

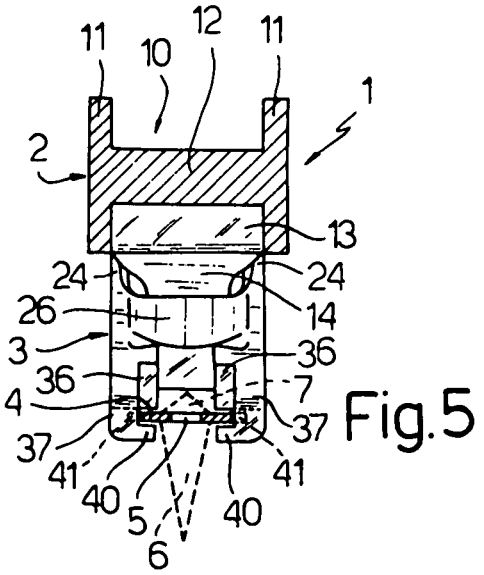

Fig.5

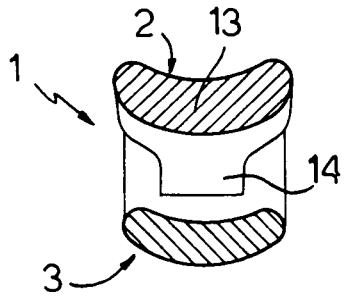

Fig.6

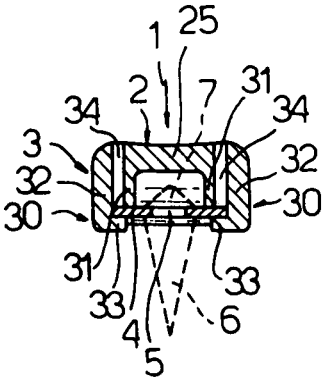

Fig.8

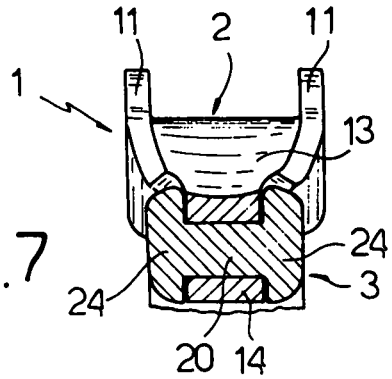

Fig.7

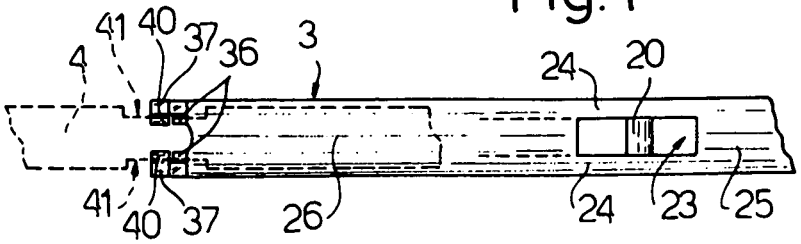

Fig.4

SPECIFICATION

Windshield wiper blade

The present invention relates to a windshield wiper. As is known, these wiper blades are provided with an armature comprising, generally, an arc-shaped main support element apt to be connected to an arm of an actuator device and supporting at least a rocker element which carries, directly or by means of other rocker elements, an element shaped like a rectangular lamina, having lodged therein an upper relief of a wiper element made of rubber.

Usually, the various parts forming the said armature are made of metal, so that the coupling between the various elements, particularly between the main support element and the rocker element, is obtained by means of riveted small metal nails, or other equivalent systems, which however involve a relatively high cost of the equipment.

In order to reduce the manufacturing costs of the wiper blade, windshield wiper blades have been constructed in which the various parts of the armature are made of plastics, so that the coupling between the various parts, in particular the coupling between the rocker member and the main support element, may be obtained by means of pins, formed integrally with one of the elements, which engage in corresponding cavities formed in other element. However, in the manufacturing of these coupling systems some problems arise, inasmuch as the said elements of the armature must be sufficiently rigid to maintain a certain profile of the blade in order to ensure a substantially uniform rest pressure of the wiper element on the glass, and at the same time such rigidity must not be excessive in order to allow a limited deformability during the engagement of the pins in the respective cavities. Such problems are partly resolved by providing pins of reduced height, or lead-ins towards the respective cavities, or other similar solutions, which however often jeopardize the reliability of the coupling.

It is an object of the present invention to provide a windshield wiper blade in which the engagement between the various elements forming the armature, in particular between the main support element and the rocker element, is obtained with the aid of means of reduced cost which however ensure in an absolute manner the reliability of the coupling, so as to avoid the mentioned problems arising with the known windshield wiper blades.

According to the present invention there is provided a windshield wiper blade having an armature comprising a main support element apt to be connected to an actuator arm and carrying at least a rocker element which carries, directly or by means of other rocker elements, a lodging element of a wiper element, characterized in that the said rocker element is supported by the said support element with the aid of coupling means which allow a relative rotation between the said two elements, and a relative displacement between the said two elements only when the said elements are in a pre-established mutual position.

For a better understanding of the present invention an embodiment thereof will now be described in detail, by way of non limiting example, with reference to the accompanying drawings, in which:

FIGURES 1 and 2 are a side view and a top view, rispectively, of the windshield wiper blade according to the invention,

FIGURE 3 is a sectional view along the line III-III showing the windshield wiper blade shown in Fig. 2,

FIGURE 4 is a partial view, from the bottom, of the windshield wiper blade shown in Figures 1 and 2, and

FIGURES 5, 6, 7 and 8 are sectional views along lines V-V, VI-VI, VII-VII, VIII-VIII of the wiper blade shown in Fig. 1.

Referring now to Figures from 1 to 3, the windshield wiper blade according to the present invention is provided with an armature 1 which comprises a main support element 2, at the two ends of which there are coupled, according to the characteristics of the present invention, two corresponding rocker elements 3 which carry, in the way which will be described later, an element 4 in the shape of a rectangular lamina and which is provided with a longitudinal slit 5 (visible in Figures 5 and 8) for accommodating a wiper element 6 which usually is made of rubber. The said wiper element 6 is connected, in a known manner, to the element 4 through the insertion of an upper portion 7 which is inserted beyond the longitudinal slit 5, and being larger in cross-section than this latter, rests on the upper surface of the lamina-shaped element 4.

The main support element 2 is formed, in its central zone, with a through cavity 10 defined by two sidewalls 11 which are connected integrally by a transversal stake 12 for the connection, in a known and not shown manner, to an actuator arm of the windshield wiper blade. At the ends of the cavity 10 the two sidewalls 11 give origin to two arms 13 which define, as a whole, an arcuate profile for the main support element 2 and which have a concave profile cross-section, as shown in Fig. 6. Towards the ends, the said two arms 13 are provided with a portion 14 having a smaller width and which develops towards the lower zone of the armature 1. The said portion 14 defines, at the end of the arm 13, a slit 15 which is open at the outer end of the arm 13, whilst the other, in the said portion 14, forms a closed cavity 16 having a circular cross-section and a diameter larger than the width of the slit 15. In the said cavity 16 is apt to accomodate, in the way which will be described later, a stake 20 pertaining the the rocker element 3. The said stake 20 has a circular cross-section, whose diameter is slightly smaller than the diameter of the cavity 16, and is provided with two bevels defined by two diametrically opposed plane parallel walls 21 whose distance is slightly smaller than the width of the slit 15.

Each rocker element 3 is provided, in its central portion, with a through cavity 23 defined by two

sidewalls 24 between which has origin, integrally therewith, the stake 20. At the ends of the said through cavity 23, the said two sidewalls 24 define two arms 25 and 26 which are inclined towards the lower zone of the armature 1 and have, they too, a transversal profile which has a profile concave towards the upper portion of the armature 1. In particular, arm 25 has a profile such as to substantially follow the profile of the arm 13 of the main support element 2, when the rocker element 3 is disposed, relative to the support element 2, in such a way that the lamina-shaped element 4 results in being horizontal; arm 26 has, at least on its upper surface, the same dimensions of the curvature of the lower surface of arm 13 of the support element 2, in order to allow a mutual engagement between arms 26 and 13, when the rocker element 3 is rotated about the stake 20.

At its outer end the arm 25 has an edge 27 of substantially circular cross-section, which projects towards the lower zone of the armature 1, so as to substantially constitute a protection for the end of the lamina-shaped element 4; therefore, the said arm 25 is provided, in the zone adjacent the end, with a pair of feet 30 having a first inner portion 31, turned vertically towards the lower zone of the armature 1, and a second outer portion 32 parallel to the portion 31 and having, at its lower part, an extension 33 turned towards the centre of the armature 1. The distance between the inner ends, mutually turned towards one another, of the two extensions 33 of the two feet 30, is smaller than the width of the lamina-shaped element 4, so as to be able to support this latter (Fig. 8), and the distance between the lower surface of the parts 31 and the upper surface of the extensions 33 is substantially equal to the height of the said lamina-shaped element 4, so as to prevent this latter from substantially moving in a vertical direction. In the two pairs of feet 30 there are formed two holes 34 which allow to conveniently mould the extensions 33.

The arms 26 are provided, towards their ends, with a first pair of feet 36 and second pair of feet 37 which are similar to the parts 31 and 32, respectively, of the pairs of feet 30. In fact, also these pairs of feet 37 have, at the lower end, two extensions 40, turned mutually towards them, and in which the distance between their inner ends is smaller than the width of the lamina-shaped element 4, whilst the distance between the lower surface of the feet 36 and the upper surface of the said extensions 40 is slightly larger than the thickness of the said lamina-shaped element 4. However, a particular difference consists in that the thickness of the said feet 37 is greater than the thickness of the parts 32 of the feet 30, and therefore the inner surfaces of the said feet 37 are disposed more internally, with respect to the diametral plane of the armature 1, than the inner surfaces of the said parts 31. The said feet 37 are therefore disposed in corresponding notches 41 formed in lateral zones of the lamina-shaped element 4 (Figures 3, 4 and 5); the length of these notches 41 is larger than the length of the said feet 37, so as to allow a relative sliding between the element 4 and the rocker element 3, as will be described later.

The coupling between the rocker element 3 and the main support element 2, in the windshield wiper blade of the present invention, is obtained in the following manner.

As can be seen in Fig. 3, when the rocker element 3 is in such a position that the lamina-shaped element 4 is substantially horizontal, the stake 20 is disposed with its greater dimension parallel to the width of the slit 15, so that the stake 20 oscillates in the cavity 16, but cannot come out from the slit 15, and thus the rocker element 3 may rotate relatively with respect to the main support elements 2, without disengaging from this latter. The disengament between the rocker element 3 and the support element 2 takes place only by rotation of the rocker element 3 by 90° about the stake 20, so that the plane parallel parts 21 result in being situated in corrispondence with the lower and upper surfaces of the slit 15. This relative position between the rocker element 3 and the support element 2, which does not occur in the conditions of utilization of the windshield wiper blade, is the only position which therefore allows the extraction of the rocker element 3 and which, previously, has allowed its engagement with the support element 2.

To avoid, anyway, that when the windshield wiper blade is not resting with the wiper element 6 on the surface which has to be cleaned, the rocker elements 3 may assume such unique position of extraction the said notches 41 have been formed, which notches, in combination with the pairs of feet 37, form a limit to the relative sliding, which is up to a certain extent necessary for the utilization of the wiper blade, between the lamina-shaped accomodation element 4 and pairs of feet 37 of the rocker element 3. In this way the rotation of the rocker element 3 is limited up to such a value that the pairs of feet 37 rest on the edge of the notches 41, and even with a curved position of the lamina-shaped element 4 the position of disengagement of the rocker elements 3 is not attained. Such relative coupling between pairs of feet 37 of the rocker element 3 and the notches 41 of the lamina-shaped element 4 constitutes also an impedance to the extraction of the said lamina-shaped element 4 from the rocker elements 3.

With the windshield wiper blade of the present invention there is thus obtained the advantage of having a reliable engagement between the rocker elements 3 and the main support element 2, with the possibility of rotation of the rocker elements 3, without the risk of a disengagement of the same, and with very simple coupling modalities, since such coupling takes place without any dangerous deformation of the parts, in only two predetermined positions (mutually rotated by 180°) of the rocker elements 3 with respect to the main support element 2.

The concave profile shape of the arms 13 of the main support element 2 and of the arms 25 and 26 of the rocker elements 3 allows also to confere to the windshield wiper blade particular aerodynamical characteristics.

Finally, it is clear that the embodiment described hereinabove of the windshield wiper blade according to the present invention is susceptible of modifications and variations without departing from the

scope of the invention itself.

For example, coupled to the main support element 2 may be a single rocker element 3, at one of its ends, or the two rocker elements 3, instead of directly supporting the lodging element 4 of the wiper element 6, may support further rocker elements coupled by the same described system, of the present invention, of coupling to the main support element 2, and provided, in their turn, with the pairs of feet for supporting the plane lamina-shaped element 4. The shape of the stake 20 also may be varied, having substantially in its cross-section, between the straight lines passing through the centre, a maximum dimension slightly smaller than the diameter of the cavity 16, and a minimum dimension slightly smaller than the width of the slip 15.

All elements forming the armature 1 may conveniently be moulded of relatively rigid plastics or of any other suitable material.

CLAIMS

1. A windshield wiper blade having an armature comprising a main support element apt to be connected to an actuator arm and carrying at least a rocker element which carries, directly or by means of other rocker elements, a lodging element of a wiper element, characterized in that the said rocker element is suported by the said support element with the aid of coupling means which allow a relative rotation between the said two elements, and a relative displacement between the said two elements only when the said elements are in a pre-established mutual position.

2. A windshield wiper blade as claimed in Claim 1, characterized in that the said coupling means allow the said relative displacement between the said elements along a single direction.

3. A windshield wiper blade as claimed in Claims 1 or 2, characterized in that the said coupling means comprise a first body of non-circular cross-section and a second body having a slit apt to allow a relative displacement of the said first body only when the said first and second bodies are in a pre-established mutual position, the said second body having at the end of the said slit a cavity whose cross-section is slightly larger than the circular envelope of the said first body in order to allow a relative rotation between the said first and second bodies, and whose diameter is larger than the width of the said slit.

4. A windshield wiper blade as claimed in Claim 3, characterized in that the cross-section of the said first body has a maximum dimension and a minimum dimension between the straight lines passing through its centre, the said maximum and minimum dimension being slightly smaller than the diameter of the said cavity and the width of the said slit, respectively.

5. A windshield wiper blade as claime in Claims 3 or 4, characterized in that the said first body is in the form of a stake with circular envelope, with at least a bevel having a plane wall.

6. A windshield wiper blade as claimed in any of the Claims from 3 to 5, characterized in that the said first and second bodies pertain, respectively, to the said rocker element and to the said main support element, or viceversa.

7. A windshield wiper blade as claimed in any of the Claims from 3 to 6, characterized in that the said first body is present in the central zone of the said rocker element, ad the said second body is present at the ends of the said main support element, the said main support element supporting two said rocker elements.

8. A windshield wiper blade as claimed in any of the preceding Claims, characterized in comprising means for limiting the relative sliding between the said rocker element and the said lodging element of the wiper element.

9. A windshield wiper blade as claimed in Claim 8, characterized in that the said means comprise at least a cavity in the said lodgind element, and corresponding projections of the said rocker element which are adpt to lodge in the said cavity and to constitute a limit to the relative displacement between the said two elements.

10. A windshield wiper blade as claimed in Claim 9, characterized in that the said projections pertain to feet of the said rocker element which support the said lodging element of the wiper element, the inner distance between a pair of projections, lodged in a corresponding pair of cavities, being smaller than the width of the said lodging element.

11. A windshield wiper blade as claimed in Claim 10, characterized in that the said rocker element is provided with at least a pair of feet for supporting the said lodging element of the wiper element, the inner distance between the said other pair of feet, in the support zone of the said lodging element, being substantially equal to the width of the said lodging element.

12. A windshield wiper blade as claimed in any of the preceding Claims, comprising rocker elements supporting the said lodging element of a wiper element and supported by at least a rocker element connected to the said main support element, characterized in comprising coupling means between the said rocker elements, similar to the said coupling elements between the said rocker element and the said main support element.

13. A windshield wiper blade as claimed in any of the preceding Claims, characterized in that the said main support element and/or the said rocker element have a concave profile.

14. A windshield wiper blade as claimed in any of the preceding Claims, characterized in that the said main support element and the said rocker element are made of relatively rigid plastics.

15. A windshield wiper blade as claimed in any of the preceding Claims, characterized in comprising means for preventing a relative displacement between the said two elements along the respective axis of rotation.

16. A windshield wiper blade as claimed in Claim 15, characterized in that the said means comprise sidewalls of one of the elements, the said sidewalls originating a cavity in which the other element is accommodated.

17. A windshield wiper blade, substantially as described hereinabove with reference to the annexed drawings.

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